

1400/0110



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Green et al.

)
) Art Unit: N/A
)
) Examiner: N/A
)
 Filed APRIL 3, 2001) Atty Ref: GRE001

EE
EE-400

Serial Number

09/823,992

Filed

APRIL 3, 2001

For: MASS SPECTROMETRY AND METHODS OF MASS SPECTROMETRY

THE COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

Sir:

The below identified communication(s) or document(s) is(are) submitted in the above application or proceeding:

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Respectfully submitted,



Everett G. Diederiks, Jr.
 Attorney for Applicant
 Registration Number: 33,323

Date: May 10, 2001



INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
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NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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Dated


17 APR 2001

Patents Form 1/77

Patents Act 1977
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29 NOV 2000

The Patent Office

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1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

85.74495

2. Patent application number
(The Patent Office will fill in this part)

0029040.3

29NOV00 E587475-1 D00027
P01/7700 0.00-0029040.33. Full name, address and postcode of the
or of each applicant (underline all surnames)Micromass Limited
Floats Road, Wythenshawe
Manchester, M23 9LZ
United Kingdom

Patents ADP number (if you know it)

0896102001
United KingdomIf the applicant is a corporate body, give
country/state of incorporation

4. Title of the invention

Orthogonal Time of Flight Mass
Spectrometer

5. Name of your agent (if you have one)

Frank B. Dehn & Co.

"Address for service" in the United Kingdom
to which all correspondence should be sent
(including the postcode)179 Queen Victoria Street
London
EC4V 4EL

Patents ADP number (if you know it)

166001

Country

Priority application number
(if you know it)Date of filing
(day / month / year)6. If you are declaring priority from one or more
earlier patent applications, give the country
and the date of filing of the or of each of these
earlier applications and (if you know it) the or
each application number7. If this application is divided or otherwise
derived from an earlier UK application,
give the number and the filing date of
the earlier application

Number of earlier application

Date of filing
(day / month / year)8. Is a statement of inventorship and of right
to grant of a patent required in support of
this request? (Answer 'Yes' if:

Yes

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an
applicant, or
- c) any named applicant is a corporate body.
See note (d)

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description 2/8

Claim(s)

Abstract

Drawing(s)

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents
(please specify)

11.

I/We request the grant of a patent on the basis of this application.

Signature

Date 29 November 2000

12. Name and daytime telephone number of person to contact in the United Kingdom

P. M. Jeffrey
01273 244200

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Notes

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Increasing Dynamic Range of an Orthogonal Time of Flight Mass Spectrometer Using Fast Sensitivity Switching During Acquisition.

Background.

The use of a time to digital converter (ion arrival counter) as an acquisition device for oaTOF results in a restriction to the ultimate dynamic range for the detection of short-lived signals. Even after the application of dead time correction software, ion signals resulting in more than 1 ion arrival, on average, per pushout event at a given m/z value, result in saturation, non linear response and inaccurate exact mass determination. This limitation is accentuated in GC MS applications because of the narrow chromatographic peaks presented to the TDC which can commonly be in the order of 2 seconds wide at the base. In this case, with the system operating at 25KHz pushout frequency, a total of 25,000 ions can be recorded for a given m/z value during a chromatographic peak elution before significant non linearity of response.

Principle of operation

To extend the dynamic range, the system has been designed to alternate between two sensitivity ranges during an acquisition. One range is tuned to be at high sensitivity. The second is adjusted to be at a lower sensitivity than the first by a factor of up to 100x. The two data streams are stored as two discrete functions presenting two discrete data sets. Once the ratio of the high sensitivity to low sensitivity data has been determined the data can be massaged to yield linear quantitative calibration curves over 4 orders of magnitude. Furthermore, the system can be arranged so that exact mass data can be extracted from either trace. Therefore, if a particular eluent produces a mass spectral peak which is saturated in the high sensitivity data set and therefore exhibits poor mass measurement accuracy, the same mass spectral peak may be unsaturated and correctly mass measured in the lower sensitivity trace. By using a combination of both traces, as sample elutes exact mass measurements may be produced over a wide range of sample concentration.

Description of design

A set of Z focussing lenses are installed into the outer ion source in a field free region of the optics. These are connected to a fast switching power supply capable of supplying from -100 to +100V DC. Initially the system is tuned to full sensitivity. The Z focusing lens voltage is then varied manually until the desired lower sensitivity is reached. Acquisition then results in fast switching of the Z lens power supply between two (or more) pre-determined voltages between each spectrum. Spectra are stored as separate functions to be post processed.

Preliminary results